Gavin Peter Hayes
Research Geophysicist
U.S. Geological Survey
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RELEVANT EXPERIENCE

Contracting Research Geophysicist, USGS NEIC (Synergetics, Inc.)
Sep. 2007-Jan. 2012
Research Geophysicist, USGS National Earthquake Information Center
Jan. 2012 to present

Gavin Hayes (Ph.D., Penn State, 2007) is a research geophysicist at the U.S. Geological Survey's National Earthquake Information Center in Golden, CO. His work is focused on issues relating tectonics, earthquake seismogenesis, and earthquake hazards mainly in the context of global subduction zones. Since joining the NEIC, Gavin has developed approaches to constrain the three-dimensional geometry of subducting plates from their shallowest definition at oceanic trenches, to their deepest seismic extent in the mid-mantle, using global earthquake catalogs and active source seismic data, coupled with probabilistic assessments of location uncertainties. Using these approaches he created and manages the "Slab1.0" database. He uses these models to study the relationships between fault geometry and earthquake rupture. Gavin is also a senior scientist heavily involved in the real time response to earthquakes at the NEIC, helping to rapidly characterize the source properties of earthquakes using moment tensor inversions and finite fault modeling, and interpreting events within their regional tectonic context to provide the public, press and scientific community a comprehensive understanding of why a specific event has occurred. He also manages databases for W-phase and rapid finite fault modeling results.

Adjunct Faculty, Colorado School of Mines Dept. of Geophysics
July 2010 to present

Since 2010, Hayes has been a faculty member of the Geophysics department at the Colorado School of Mines in Golden, CO, where he teaches in an introductory course for several weeks a year, and is involved in advising several graduate student research projects.

EDUCATION

B.S.	Geophysics, University of Leeds, Leeds, UK	2002
M.S.	Geophysics, University of Leeds, Leeds, UK	2002

Ph.D. Geosciences, Pennsylvania State University, PA 2007

PROFESSIONAL SERVICE:

Member, IRIS-GSN Standing Committee (2008-2012)
Panel member for USGS NEHRP Program (National Awards), 2010-11
Member, IRIS Data Products Working Group (2011-present)

TECHNICAL ACTIVITIES

- *NEIC Earthquake Tectonic Summaries.* I write 2-4 paragraph tectonic summaries for significant global earthquakes, describing the tectonic setting, faulting mechanism and general interpretation of recent earthquakes within a few hours of the event occurring, typically for a dozen or more earthquakes per year.
- *W-phase Centroid Moment Tensor Solutions from the NEIC*. I have implemented and operate the W-phase CMT inversion used by the NEIC for computing the size and faulting mechanism of moderate-to-large earthquakes in real-time. I publish moment tensors for almost all M5.6+ earthquakes; typically hundreds per year.
- *Finite Fault Models from the NEIC.* I have implemented and operate the Finite Fault Inversion used by the NEIC for computing source dimensions of large earthquakes in near real-time. I publish slip models for almost all M7+ earthquakes; typically a dozen or more per year.
- *Global Seismicity Atlas.* I work with other USGS researchers, and colleagues from the academic community, to produce regional tectonic summary maps describing the detailed seismotectonics of specific regions around the world. This is part of an effort led by Harley Benz to publish a new generation seismicity atlas from the NEIC. Since 2013, I have taken over the generation of new Atlas plates (e.g., P33-36; also upcoming plates for Java and vicinity, offshore British Columbia and vicinity, and East Africa Rift and vicinity), and the effort to update original Atlas plates (P12-14, P20-25).

SELECTED AWARDS

- Best Student Poster Award, Earthscope National Meeting, March 2007.
- 2007/08 Peter Deines Lectureship Awardee (1st place in Dept. Geosciences Student Colloquium Oral Presentations, Post-Comprehensive Exam), Spring 2007.
- Synergetics Certificate of Excellence, in recognition of contributions to response to recent large earthquakes, October 2009.
- Outstanding Reviewer 2009, Geophysical Journal International, November 2009.
- Synergetics Certificate of Excellence, March 2010.
- Synergetics Certificate of Excellence, April 2011.
- **2013 IRIS/SSA Distinguished Lectureship Award**, awarded December 2012.
- **2013 Penn State University Alumni Achievement Award**; recognizes PSU alumni 35 years of age and younger for their extraordinary professional accomplishments; awarded April 2013.
- **2012 Presidential Early Career Award for Scientists and Engineers (PECASE)**; highest honor bestowed by the United States government on outstanding scientists

and professionals in the early stages of their independent research careers; awarded December 2013.

SELECTED RELEVENT PUBLICATIONS:

2014

Hayes, G.P., McNamara, D.E., Seidman, L., and Roger, J., 2014. Quantifying potential earthquake and tsunami hazard in the Lesser Antilles subduction zone of the Caribbean Region, *Geophys. J. Int.* **196**, 510-521, doi: 10.1093/gji/ggt385.

Hayes, G.P., Furlong, K.P., Benz, H.M., and Herman, H.W., 2014. Triggered aseismic slip adjacent to the 6 February 2013 Mw8.0 Santa Cruz Islands megathrust earthquake, *Earth Planet. Sci. Lett.* **388**, 265-272, doi: 10.1016/j.epsl.2013.11.010.

Barnhart, W.D., **Hayes, G.P.**, Samsonov, S.V., Fielding, E.J., and Seidman, L.E., 2014. Breaking the oceanic lithosphere of a subducting slab: the 2013 Khash, Iran earthquake, *Geophys. Res. Lett., accepted 12/2013*, doi: 10.1002/2013GL058096.

Ruiz, J.A., **Hayes, G.P.**, Carrizo, D., Kanamori, H., Socquet, A., and Comte, D., 2014. Seismological analyses of the March 11, 2010, Pichilemu, Chile Mw 7.0 and Mw 6.9 coastal intraplate earthquakes, *Geophys. J. Int., accepted 12/2013,* doi: 10.1093/gji/ggt513

2013

Hayes, G.P., Bergman, E., Johnson, K., Benz, H.M., Brown, L., and Meltzer, A., 2013. Seismotectonic framework of the February 27, 2010 Mw 8.8 Maule, Chile earthquake sequence, *Geophys. J. Int.* **195**, 1034-1051, doi: 10.1093/gji/ggt238

Hayes, G.P., 2013. An overview of the Feb 27, 2010 Mw 8.8 Maule, Chile earthquake sequence, *Summary of the Bulletin of the International Seismology Centre* **47(1-6)**, 88-103.

Bazargani, F., Hale, D., and **Hayes, G.P.**, 2013. Tensor-guided fitting of subducting slab depths, *Bull. Seis. Soc. Amer.* **103(5)**, 2657-2669, doi: 10.1785/0120120333.

2012

Hayes, G.P., Wald, D.J., and Johnson, R.L., 2012. Slab1.0: A three-dimensional model of global subduction zone geometries, *J. Geophys. Res.* **117**, B01302, doi:10.1029/2011JB008524.

Rietbrock, A., Ryder, I., **Hayes, G**., Haberland, Ch., Comte, D., Roecker, S., Lyon-Caen, H., 2012. Aftershock seismicity of the 2010 Maule Mw=8.8, Chile, earthquake: Correlation between co-seismic slip models and aftershock distribution? *Geophys. Res. Lett.* **39**, doi: 10.1029/2012GL051308.

Duputel. Z., Rivera, L., Kanamori, H., **Hayes, G.P.**, 2012. W phase source inversion for moderate to large earthquakes (1990-2010), *Geophys. J. Int.* **189**, 1125-1147.

Wang, D., Becker, N.C., Walsh, D., Fryer, G.J., Weinstein, S.A., McCreery, C.S., Sardiña, V., Hsu, V., Hirshorn, B.F., **Hayes, G.P.**, Duputel, Z., Rivera, L., Kanamori, H., Koyanagi, K.K., Shiro, B., 2012. Realtime forecasting of the April 11, 2012 Sumatra tsunami, *Geophys. Res. Lett.* **39**, doi:10.1029/2012GL053081.

2011

Hayes, G.P., 2011. Rapid source characterization of the 2011 Mw 9.0 off the Pacific coast of Tohoku earthquake, *Earth. Planets and Space*, **63**, 1-6.

Hayes, G.P., Earle, P.S., Benz, H.M., Wald, D.J., Briggs, R.W., and the USGS/NEIC Earthquake Response Team, 2011. 88 Hours: The U.S. Geological Survey National Earthquake Information Center response to the 11 March 2011 Mw 9.0 Tohoku earthquake, *Seis. Res. Lett.* **82(4)**, 481-493.

Tsai, V.C., **Hayes, G.P.**, and Duputel, Z., 2011. Constraints on the long-period moment-dip tradeoff for the Tohoku earthquake, *Geophys. Res. Lett., accepted 09/22/11.*

Duputel, Z., Rivera, L., Kanamori, H., **Hayes, G.P.**, Hirshorn, B., & Weinstein, S., 2011. Real-time W Phase inversion during the 2011 off the Pacific coast of Tohoku earthquake, *Earth, Planets and Space*.

Newman, A.V., **Hayes, G.P.**, Wei, Y., Convers, J., 2011. The 25 October 2010 Mentawai tsunami earthquake, from real-time discriminants, finite-fault rupture, and tsunami excitation, *Geophys. Res. Lett.,* **38**, L05302, doi:10.1029/2010GL046498.

2010

Hayes, G.P., Briggs, R.W., Sladen, A., Fielding, E.J. Prentice, C., Hudnut, K., Mann, P., Taylor, F.W., Crone, A.J., Gold, R., Ito, T., and Simons, M., 2010. Complex rupture during the 12 January 2010 Haiti earthquake, *Nature Geo.,* doi:10.1038/NGEO0977.

Hayes, G., Kanamori, H., Lay, T., and Ammon, C., 2010. The GSN and large earthquakes, *in the IRIS Annual Report 2010.*

Hayes, G.P., and Furlong, K.P., 2010. Quantifying potential tsunami hazard in the Puysegur subduction zone, south of New Zealand, *Geophys. J. Int.,* **183(3)**, 1512-1524.

2009

Hayes, G.P., Rivera, L, and Kanamori, H., 2009. Source inversion of W-phase: Real-time implementation and extension to low magnitudes, Seis. Res. Lett., 80(5), 817-822.

Hayes, G.P., Wald, D.J., and Keranen, K., 2009. Advancing techniques to constrain the geometry of the seismic rupture plane on subduction interfaces *a priori* – higher order functional fits, *Geochem. Geophys. Geosyst.*, **10**, Q09006, doi:10.1029/2009GC002633.

Hayes, G.P., Furlong, K.P., and Ammon, C.J., 2009. Intraplate Deformation Adjacent to the Macquarie Ridge South of New Zealand - The Tectonic Evolution of a Complex Plate Boundary, *Tectonophysics,,* doi:10.1016/j.tecto.2008.09.024*.*

Hayes, G.P., and Wald, D.J., 2009. Developing framework to constrain the geometry of the seismic rupture plane of subduction interfaces *a priori* – a probabilistic approach, *Geophys. Jour. Int.,* **176**, 951-964.

2007

Hayes, G.P., 2007. Integrating seismological and tectonic studies to constrain lithospheric evolution at complex plate boundaries, PhD Thesis, Department of Geosciences, Penn State University.

Hayes, G.P., and Furlong, K.P., 2007, Abrupt Changes in Crustal Structure Beneath the Coast Ranges of Northern California – Developing New Techniques in Receiver Function Analysis, *Geophys. Jour. Int,* **170**, 313-336.

Pre-2007

Hayes, G.P., Johnson, C.B., and Furlong, K.P., 2006, Evidence for melt injection in the crust of Northern California?, *Ear. Plan. Sci. Lett.* **248**, 638–649.

Hayes, G.P., Stuart, G.W., and Reyners, M., 2004, The Waiouru, New Zealand, earthquake swarm – persistent mid crustal activity near an active volcano, *Geophys. Res. Lett.,* **31***, doi:10.1029/2004GL020709.*

Regional Summary Posters

Smoczyk, G.M., **Hayes, G.P.**, Hamburger, M.W., Benz, H.M., Villaseñor, Antonio, and Furlong, K.P., 2013, Seismicity of the Earth 1900–2012 Philippine Sea Plate and vicinity: U.S. Geological Survey Open-File Report 2010–1083-M, scale 1:10,000,000, http://dx.doi.org/10.3133/ofr20101083m.

Hayes, G.P., Bernardino, Melissa, Dannemann, Fransiska, Smoczyk, Gregory, Briggs, Richard, Benz, H.M., Furlong, K.P., and Villaseñor, Antonio, 2013, Seismicity of the Earth 1900–2012 Sumatra and vicinity: U.S. Geological Survey Open-File Report 2010–1083-L, scale 1:6,000,000, http://pubs.usgs.gov/of/2010/1083/l/.

Turner, Bethan, Jenkins, Jennifer, Turner, Rebecca, Parker, A.L., **Hayes, G.P.**, Villaseñor, Antonio, Dart, R.L., Tarr, A.C., Furlong, K.P., and Benz, H.M., 2013, Seismicity of the Earth 1900–2010 Himalaya and vicinity: U.S. Geological Survey Open-File Report 2010–1083–J, scale 1:9,000,000.

Jenkins, Jennifer, Turner, Bethan, Turner, Rebecca, **Hayes, G.P.**, Davies, Sian, Dart, R.L., Tarr, A.C., Villaseñor, Antonio, and Benz, H.M., 2013, Seismicity of the Earth 1900–2010 Middle East and vicinity: U.S. Geological Survey Open-File Report 2010–1083-K, 1 sheet, scale 1:7,000,000.

Benz, H.M., Tarr, A.C., **Hayes, G.P.**, Villaseñor, Antonio, Furlong, K.P., Dart, R.L., and Rhea, Susan, 2011, Seismicity of the Earth 1900–2010 Caribbean plate and vicinity: U.S. Geological Survey Open-File Report 2010–1083-A, scale 1:8,000,000.

Benz, H.M., Dart, R.L., Villaseñor, Antonio, **Hayes, G.P.**, Tarr, A.C., Furlong, K.P., and Rhea, Susan, 2011, Seismicity of the Earth 1900–2010 Aleutian arc and vicinity: U.S. Geological Survey Open-File Report 2010–1083-B, scale 1:5,000,000.

Benz, H.M., Dart, R.L., Villaseñor, Antonio, **Hayes, G.P.**, Tarr, A.C., Furlong, K.P., and Rhea, Susan, 2011, Seismicity of the Earth 1900–2010 Mexico and vicinity: U.S. Geological Survey Open-File Report 2010–1083-F, scale 1:8,000,000.

Benz H.M., Herman, Matthew, Tarr, A.C., **Hayes, G.P.**, Furlong, K.P., Villasenor, Antonio, Dart, R.L., and Rhea, Susan, 2011, Seismicity of the Earth 1900–2010 Australia plate and vicinity: U.S. Geological Survey Open-File Report 2010–1083-G, scale 1:15,000,000.

Benz, H.M., Herman, Matthew, Tarr, A.C., **Hayes, G.P.**, Furlong, K.P., Villaseñor, Antonio, Dart, R.L., and Rhea, Susan, 2011, Seismicity of the Earth 1900–2010 New Guinea and vicinity: U.S. Geological Survey Open-File Report 2010–1083-H, scale 1:8,000,000.

Benz, H.M., Herman, Matthew, Tarr, A.C., **Hayes, G.P.**, Furlong, K.P., Villaseñor, Antonio, Dart, R.L., and Rhea, Susan, 2011, Seismicity of the Earth 1900–2010 eastern margin of the Australia plate: U.S. Geological Survey Open-File Report 2010–1083-I, scale 1:8,000,000.

Rhea, S., **Hayes, G.**, Villaseñor, A., Furlong, K.P., Tarr, A.C., and Benz, H.M., 2010, Seismicity of the Earth 1900-2007, Nazca plate and South America: U.S. Geological Survey Open-File Report 2010-1083-E, 1 map sheet, scale 1:12,000,000.

Rhea, S., Tarr, A.C., **Hayes, G.**, Villaseñor, A., Furlong, K.P., and Benz, H.M., 2010, Seismicity of the Earth 1900-2007, Kuril-Kamchatka arc and vicinity: U.S. Geological Survey Open-File Report 2010-1083-C, 1 map sheet, scale 1:5,000,000.

Rhea, S., Tarr, A.C., **Hayes, G.**, Villaseñor, A., and Benz, H.M., 2010, Seismicity of the Earth 1900-2007, Japan and vicinity: U.S. Geological Survey Open-File Report 2010-1083-D, 1 map sheet, scale 1:5,000,000.

Products/Databases Managed

Slab1.0, USGS database of subduction zone geometries:
http://earthquake.usgs.gov/research/data/slab/

USGS WPhase Moment Tensor Solutions: e.g.,
http://comcat.cr.usgs.gov/earthquakes/eventpage/pde20110311054624120_29#scientific_moment-tensor

USGS Finite Fault Models of Large Earthquakes: e.g.,
http://comcat.cr.usgs.gov/earthquakes/eventpage/usb000jyiv#scientific_finite-fault

Invited Talks

- *Penn State University Dept. Geoscience, Peter Deines Lectureship 2007*: Tectonic Evolution of a Complex Plate Boundary - Fiordland to Macquarie Ridge, New Zealand, November 2007.
- *Colorado School of Mines Heiland Lecture Series*: Tectonic Evolution of a Complex Plate Boundary - Fiordland to Macquarie Ridge, New Zealand, January 2008.
- *University of Alaska Fairbanks*: Imaging Crustal Evolution in the Transition from Subduction to Translation, Northern San Andreas Fault System, April 2010.
- *University of Alaska Fairbanks*: The many potential uses for a new global subduction zone interface geometry model – implications for seismogenic processes, April 2010.
- *Asia Oceania Geosciences Society Annual Meeting 2009*: A new global subduction zone interface geometry model – implications for seismogenic processes.
- *GSA 2009*: The USGS toolbox for earthquake planning and response.
- *Colorado College*: The USGS toolbox for earthquake planning and response, November 2009.
- *Colorado School of Mines Heiland Lecture Series*: The USGS response to the January 2010 Haiti earthquake, January 2010.
- *Crustal Deformation Modeling Workshop. Colorado*: The USGS Response to Recent Large Earthquakes: A Seismological Overview of the Haiti, Chile, and El Mayor Events, June 2010.
- *8th Joint Meeting of UJNR Panel on Earthquake Research*: The USGS Response to Recent Large Earthquakes, October 2010.

- *AGU 2010*: Real time source inversion of the Maule earthquake.
- *SSA 2011*: The USGS-NEIC response to the 2011/03/11 Mw 9.0 Tohoku earthquake – magnitude and rupture modeling.
- *Osher Lifelong Learning Institute, Denver*: Earthquakes and the NEIC, May 2011.
- *Colorado University Boulder*: NEIC operations and real-time earthquake response, September 2011.
- *Universidad de Chile Departmento de Geofisica*: NEIC operations and real-time earthquake response, March 2012.
- *IRIS Webinar:* Earthquake science at the border between real time response and long-term research (http://www.iris.edu/hq/webinar/), August 2012.
- *AGU 2012:* USGS NEIC earthquake monitoring, response and research in the northern Pacific region.
- *Penn State University Department of Geosciences Seminar Series:* BAQs! Shaking up earthquake response, April 2013.
- *American Museum of Natural History, New York City:* Mitigating Disasters: earthquake response in the 21st century (**IRIS Distinguished Lectureship Seminar**), September 2013.
- *Colorado State University Department of Geosciences Seminar Series:* Mitigating Disasters: earthquake response in the 21st century, November 2013.
- *Universidad de Chile Departmento de Geofisica*: Current research activities at the USGS NEIC, January 2014.
- *Southwestern Oregon Community College, Coos Bay, Oregon:* Mitigating Disasters: earthquake response in the 21st century (**IRIS Distinguished Lectureship Seminar**), January 2014.
- *Town Hall Seattle, Seattle, Washington:* Mitigating Disasters: earthquake response in the 21st century (**IRIS Distinguished Lectureship Seminar**), April 2014.

Convened Sessions

- Lay, T., Tsai, V., **Hayes, G.**, Rubinstein, J., The March 2011 Tohoku, Japan and February 2011 Christchuch, New Zealand Earthquakes, SSA 2011.
- Hashimoto, M., Sagiya, T., Satake, K., **Hayes, G.P.**, Lay, T., Simons, M., The Great March 2011 Tokoku Earthquake, AGU 2011.
- Trabant, C., Velasco, A., **Hayes, G.**, Data Products as Research Resources, SSA 2013.
- **Hayes, G.P.**, Earle, P.S., Benz, H.M., The Magnitude X.X Earthquake on the YY of ZZZZ: Major Earthquakes of 2012/13, SSA 2013.
- **Hayes, G.P.**, Lay, T., Benz, H., Ammon, C., Large and damaging earthquakes of 2013/14, SSA 2014.

Abstracts (First Author Only)

Prior to 2012 (hired as permanent USGS), below is a list of abstracts published for major global conferences, of which I am first author:

A1. **Hayes, G. P.**, Furlong, K. P., Schwartz, S. Y., Ammon, C. J., & Hall, C., 2003. Integrating seismological studies of crustal structure in the northern California Coast Ranges to construct a regional 3D strain model; *AGU 2003 fall meeting. EOS, Transactions, American Geophysical Union*, **84**, Abstract T51C-04.

A2. **Hayes, G. P.**, Furlong, K. P., & Schwartz, S. Y., 2004. Using receiver functions to analyze rapid transitions in crustal structure and deformation in northern California; *AGU 2004 fall meeting. EOS, Transactions, American Geophysical Union*, **85**, Abstract T33C-1396.

A3. **Hayes, G. P.**, Furlong, K. P., and Schwartz, S. Y., 2005. The crustal structure of the northern California Coast Ranges from receiver functions*, Geological Society of America, Cordilleran section, 101st annual meeting; American association of petroleum geologists, pacific section, 80th annual meeting. Abstracts with Programs - Geological Society of America*, **37**, p. 68.

A4. **Hayes, G. P.**, Johnson, C. B., & Furlong, K. P., 2005. Evidence for melt injection in the crust of northern California? *AGU 2005 fall meeting. EOS, Transactions, American Geophysical Union*, **86**, Abstract S21C-04.

A5. **Hayes, G.P.**, and Furlong, K.P., 2006. The Evolution of a Plate Boundary System - crustal structure, seismicity and volcanism in Northern California, *Seism. Res. Lett.* **77:2**, p. 204.

A6. **Hayes, G.P.**, and Furlong, K.P., 2007. Quantifying regional velocity ratio in California: using seismic data to map shallow structure*, 2007 Earthscope National Meeting*, Poster 131.

A7. **Hayes, G. P.**, and Furlong, K. P., 2007. Intraplate deformation adjacent to the Macquarie Ridge south of New Zealand; the tectonic evolution of a complex plate boundary; *AGU 2007 fall meeting. EOS, Transactions, American Geophysical Union*, **88**, Abstract T23B-1422.

A8. **Hayes, G.P.**, and Wald, D.J., 2008. Developing framework for constraining the geometry of the seismic rupture plane *a priori* – a probabilistic approach, *Seism. Res. Lett.* **79:2**, p. 344.

A9. **Hayes, G.P.**, and Wald, D.J., 2008. Developing framework for constraining the geometry of the seismic rupture plane *a priori, 2008 IRIS Workshop, Stevenson, WA.*

A10. **Hayes, G.P.**, and Wald, D.J., 2008. Resolving the geometry of global subduction interfaces *a priori* – working towards improved earthquake source modeling, *AGU 2008 fall meeting, EOS Transactions, American Geophysical Union*, **89**, Abstract U51A-0001.

A11. **Hayes, G.P.**, and Furlong, K.P., 2009. Potential significant tsunami hazard in the Puysegur subduction zone, south of New Zealand, *Geophys. Res. Abstracts*, **11**, EGU2009-3550.

A12. **Hayes, G.P.**, Wald, D.J., & Ji., C., 2009. Subduction geometry constraints for earthquake source inversions and hazard analyses, *Asia Oceania Geosciences Society,* Abstract SE55-A027.

A13. **Hayes, G.P.**, Wald, D.J., Earle, P.E., Jaiswal, K., Lin, K-W, Marano, K., & Hearne, M., 2009. The USGS toolbox for earthquake planning and response, *Geological Society of America Abstracts with Programs*, **41**, p. 429 (invited).
A14. **Hayes, G.P.**, Wald, D.J., & Johnson, R.J., 2009. The creation and applications of a three-dimensional model of global subduction zone geometries, *AGU 2009 fall meeting, EOS Transactions, American Geophysical Union*, **89**, Abstract T14A-04.
A15. **Hayes, G.P.**, Wald, D.J., Earle, P.E., Benz, H.M., Briggs, R.W., Sipkin, S.A., Dewey, J.W., Choy, G., Jaiswal, K., Lin, K-W, Marano, K., & Hearne, M., 2010. The USGS National Earthquake Information Center response to recent large earthquakes, *Seism. Res. Lett.* **81:3**, p. 543.
A16. **Hayes, G.P.**, & Wald, D.J., 2010. Applications of a new three-dimensional model of global subduction zone geometries to the understanding of seismogenesis, *AGU Chapman conference on giant earthquakes and their tsunamis.*
A17. **Hayes, G.P.**, Earle, P.S., Wald, D.J., Benz, H.M., Ji, C., & Shao, G., Real time source inversion of the Maule earthquake, Invited abstract G31B-01 presented at 2010 *Fall Meeting, AGU, San Francisco, Calif.*, 13-17 Dec.
A18. **Hayes, G.P.**, & Wald, D.J., 2011. Exploring interface coupling variability using new models of three-dimensional subduction zone geometries, Abstract T43E-08 presented at 2010 *Fall Meeting, AGU, San Francisco, Calif.*, 13-17 Dec.
A19. **Hayes, G.P.**, Wald, D.J., 2011. Exploring controls on seismogenesis by comparing models of three-dimensional subduction geometry with source inversions of large earthquakes, *Seism. Res. Lett.* **82:2**, p. 306.
A20. **Hayes, G.P.**, Earle, P.S., Benz, H.M., Wald, D.J., Briggs, R.W., and the USGS/NEIC Earthquake Response Team, 2011. The USGS-NEIC response to the 2011/03/11 Mw 9.0 Tohoku earthquake – magnitude and rupture modeling, *Seism. Res. Lett.* **82:3**, p. 453 (invited).
A21. **Hayes, G.P.**, Wald, D.J., and Briggs, R.W., 2011. Systematically Analyzing Relationships Between Three-Dimensional Subduction Zone Geometry and Slip During Great Earthquakes of the 21st Century, Abstract U53D-0091 presented at 2011 *Fall Meeting, AGU, San Francisco, Calif.*, 05-09 Dec.

---------- Entered USGS Service 01/12 ----------

Below is a list of abstracts published (since hired into USGS service) for major global conferences, of which I am an author or co-author:

A22. **Hayes, G.P.**, Bergman, E.A., Benz, H.M., Brown, L., and Meltzer, A., 2012. Seismotectonic framework of the Feb 27, 2010 Mw 8.8 Maule, Chile Earthquake Sequence, Abstract S24A-04, presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
A23. **Hayes, G.P.**, 2012. USGS NEIC Monitoring, Response and Research in the Northern Pacific Region, Invited abstract NH14A-05 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
A24. Meyers, B., Furlong, K., **Hayes, G.**, Herman, H., and Quigley, M., 2012. Surface and subsurface fault displacements from the September 2010 Darfield (Canterbury)

earthquake, abstract T33A-2645 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

A25. Blaser, A., and Hayes, G., 2012. Sensitivity analysis as a proxy for estimating uncertainty in Slab1.0 3D subduction zone models, abstract S41A-2392 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

A26. Ruiz-Paredes, **Hayes, G.**, Socquet, A., Carrizo, D., and Kanamori, H., 2012. Seismological analysis of the March 11, 2010 Pichilemu, Chile Mw 7.0 and Mw 6.9 earthquakes, abstract S51B-2414, presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

A27. Bernardino, M.J., **Hayes, G.P.**, Dannermann, F., and Benz, H.M., 2012. Providing Seismotectonic Information to the Public Through Continuously Updated National Earthquake Information Center Products, abstract S51C-2431 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.

A28. **Hayes, G.P.**, Benz, H.M., Ji., C., Mendoza, C., and Hartzell, S., 2013. Teleseismic Rupture Modeling of Recent Large Earthquakes, *Seism. Res. Lett.* **84:2**, p. 389.

A29. **Hayes, G.P.**, Benz, H.M., Earle, P.S., Lastowka, L., Wald, D.J., Guy, M., Fee, J.M., Marinez, E.M., 2013. USGS National Earthquake Information Center (NEIC) Product Development, *Seism. Res. Lett.* **84:2**, p. 329.

A30. Bennett, S.E.K., Gold, R.D., Briggs, R.W., **Hayes, G.P.**, Powers, P.M., and Field, E.H., 2013. Does fault segmentation limit earthquake magnitude on the Wasatch fault? *Seism. Res. Lett.* **84:2**, p. 392.

A31. Barnhart, W.D., **Hayes, G.P.**, Samsonov, S.V., Fielding, E.J., and Seidman, L.E., 2013. Breaking the oceanic lithosphere of a subducting slab: the Mw7.7 2013 Khash, Iran earthquake, paper no. 291-3 presented at 2013 Fall Meeting, GSA, Denver, CO., 27-30 Oct.

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